Claims

1. Process for manufacturing fine iron or steel powders, **characterized in** the steps of
   - providing an iron based, fragmented raw material, finely divided when applicable,
   - providing a brittle material by transforming raw material to nitride by means of ammonia gas,
   - milling the nitridic material to particle sizes desired, when applicable, and
   - denitriding to a fine iron or steel powder.
2. Process according to claim 1, **characterized in** that the raw material is chosen from one or more of the material groups
   1) iron, eg iron powder and/or sponge iron
   2) iron oxide powder
   3) steel, eg steel powder and/or turning scrap.
3. Process according to claim 1 or 2 **characterized in** that the transformation to nitride is carried out at 400 – 800 °C, preferably at 500 – 700 °C.
4. Process according to claim 1, 2, or 3, **characterized in** that the nitrogen content is about 3 – 20 % by weight, preferably more than 6 % by weight.
5. Process according to anyone of the preceeding claims, **characterized in** that milling (3) is performed by means of milling equipment know per se, eg ball milling equipment or jet milling equipment, for milling materials down to micron sizes.
6. Process according to anyone of the preceeding claims, **characterized in** that milling is performed batchwise or continuously.
7. Process according to anyone of the preceeding claims, **characterized in** that a fraction of powder particles within a desired particle size interval is obtained by separation, eg by sieveing or elutriation techniques in a batchwise or continuous separation procedure (6).
8. Process according to claim 7, **characterized in** that milling and separation is performed dry or wet.

9. Process according to anyone of the preceeding claims, **characterized in** that transformation to nitride (2), milling and particle size separation is performed in an integrated process in which too coarse, separated particles are recirculated from the separation step to the transformation step.

10. Process according to anyone of the preceeding claims, **characterized in** that transformation to nitride and milling is performed in an integrated process step (4), eg by providing milling bodies during the transformation in a rotating tube furnaced.

11. Process according to anyone of the preceeding claims, **characterized in** that denitriding is performed by means of hydrogen gas.

12. Process according to claim 11, **characterized in** that denitriding is performed at 250 – 400 °C, preferably at 300 – 350 °C.

13. Process according to anyone of the preceeding claims, **characterized in** that nitride powder is produced as an alloying substance for sintering purposes.

14. Process according to anyone of the preceeding claims, **characterized in** that mean particle sizes of the produced powders are about 1 – 50 μm, preferably about 3 – 25 μm.

15. Plant for manufacturing fine iron or steel powders, **characterized by**

- means (2) for containing a fragmented iron based raw material,
- means for providing ammonia gas to said raw material for transforming iron of the raw material substantially totally to nitride,
- milling means (3), when applicable, for milling the nitridic material to particle sizes desired and
- means (8) for denitriding to a fine iron or steel powder.

16. Plant according to claim 15, **characterized in** that said transformation is intended to occur at about 400 – 800 °C, preferably at about 500 – 700 °C.

17. Plant according to claim 15 or 16, **characterized in** that said transformation is intended to provide a nitrogen content of about 3 – 20 % by weight, preferably over 6 % by weight.

18. Plant according to claim 15, 16 or 17, **characterized in** that said milling means is milling equipment of a kind known per se, eg ball milling equipment or jet milling equipment for milling materials down to micron sizes.

19. Plant according to claim 15, 16, 17 or 18, **characterized in** that the milling means are arranged for batchwise or continuous milling.

20. Plant according to claim any of claims 15 - 19, **characterized by** separation means for obtaining a fraction of powder particles within a desired particle size interval, eg sieving or elutriation means, said separation means being arranged for batchwise or continuous operation.

21. Plant according to any of claims 15 - 20, **characterized in** that milling and separation is intended to be performed dry or wet.

22. Plant according to anyone of claims 15 - 21, **characterized in** that transformation to nitride, milling and particle size separation is intended to be performed in an integrated process arrangement in which too coarse particles are arranged to be recirculated from a separation operation to a transformation operation.

23. Plant according to anyone of claims 15 – 22, **characterized by** an integrated process step for transformation to nitride and milling, eg a rotating tube furnace provided with milling bodies, during transformation.

24. Plant according to anyone of claims 15 - 23, **characterized by** arrangements for providing hydrogen gas for denitriding the nitride powder.

25. Plant according to anyone of claims 15 - 24, **characterized in** that denitriding is intended to be performed at about 250 – 400 °C, preferably about 300 – 350 °C.

26. Use of fine iron based nitride powder according to anyone of claims 1 - 14 as an alloying substance in sintered steel production.

27. Use according to claim 25, **characterized in** that mean particle sizes of the powders are about 1 – 50 μm, preferably about 3 – 25 μm.

28. Use of fine iron or steel powder according to anyone of claims 1 - 14 as material for metal injection moulding (MIM).

29. Fine iron or steel powder **characterised in** that it is produced by the process according to anyone of claims 1 - 14.